

Attempt all Questions:

Q1.[5] Which of the following devices can an administrator use to segment their LAN?

(Choose all that apply)

- A. Hubs B. Repeaters ☒ C. Switches ☒ D. Bridges ☒ ~~E. Routers~~ F. Media Converters  
G. All of the above

Ans: C, D & E

Q2.[5] Routers perform which of the following functions? (Select three)

- ☒ A. Packet switching  
☒ B. Collision prevention on a LAN segment.  
☒ C. Packet filtering  
☒ D. Broadcast domain enlargement  
☒ E. Broadcast forwarding  
☒ F. Internetwork communication

Ans: A, D & F

Q3.[5] How many subnetworks and hosts are available per subnet if you apply a /28 mask to the 210.10.2.0 class C network?

Ans: No. of subnets =  $2^4 = 16$  subnet

Q4.[5] You are a systems administrator and you are about to assign static IP addresses to various servers on your network. For the network 192.168.20.24/29 the router is assigned to the first usable host address, while the last usable host address goes to your server-X. What would you enter into the IP properties box of the server-X?

IP address: Subnet Mask: Default Gateway:

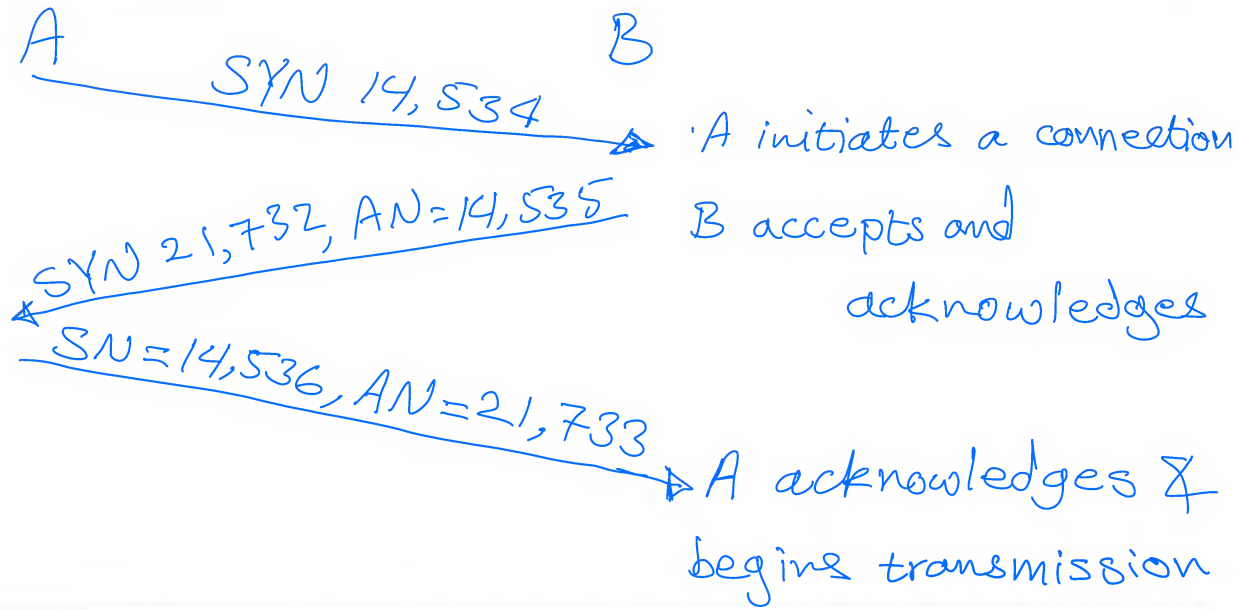
Ans: IP address: 192.168.20.30  
Subnet Mask: 255.255.255.248  
Default Gateway: 192.168.20.25

Q5.[5] What is the subnet for the host IP address 172.16.210.0/22?

Ans: 172.16.208.0/22

Q6.[5] TCP opens a connection using an initial sequence number (ISN) of 14,534. The other party opens the connection with an ISN of 21,732. Show the three TCP segments during the connection establishment.

Ans:



Q7.[12] An IPv4 datagram has arrived with the following information in the header (in hexadecimal): 0x45 00 00 54 00 03 58 50 20 06 00 00 7C 4E 03 02 B4 0E 0F 02

- Is the packet fragmented?
- What is the size of the data?
- How many more routers can the packet travel to?
- What is the protocol?
- What is the source address?
- What is the destination address?

Ans:

[a] The flags of three bit =  $(010)_2$   
 since the Don't fragment flag = 1 the packet is not fragmented.

[b] Total length field =  $(0054)_{16}$   
 $= (0000000001010110)_2$   
 $= 86 \text{ bytes}$

Internet header length (IHL) =  $(5)_{16} = 5 \text{ octets}$

IP Header size =  $5 \times 4 = 20 \text{ bytes}$

$$\begin{aligned}\text{The size of TCP datagram} &= \text{total length} - \text{TCP header size} \\ &= \text{total length} - \text{IHL} \times 4 \\ &= 86 - 5 \times 4 = 86 - 20 = 66 \text{ bytes}\end{aligned}$$

Assume the TCP header have no options or padding  
 $\Rightarrow$  TCP header size = 20 bytes

$$\begin{aligned}\text{Data size} &= \text{TCP datagram size} - \text{TCP header size} \\ &= 66 - 20 = 46 \text{ bytes}\end{aligned}$$

$$\begin{aligned}\boxed{c} \text{ Time to live (TTL)} &= (20)_{16} = (0010\ 0000)_2 \\ &= 32\end{aligned}$$

It means the packet can travel to up to 32 routers.

$$\begin{aligned}\boxed{d} \text{ Protocol field} &= (06)_{16} = (0000\ 0110)_2 = 6 \\ &\text{which means the protocol is TCP}\end{aligned}$$

$$\begin{aligned}\boxed{e} \text{ The source address} &= (7C\ 4F\ 03\ 02)_{16} \\ &= (0111\ 1100\ 0100\ 1111\ 0000\ 0011\ 0000\ 0010)_2 \\ &= 124.79.3.2\end{aligned}$$

$$\begin{aligned}\boxed{f} \text{ The destination address} &= (B4\ 0E\ 0F\ 02)_{16} \\ &= (1011\ 0100\ 0000\ 1110\ 0000\ 1111\ 0000\ 0010)_2 \\ &= 180.14.15.2\end{aligned}$$



Q8.[8] A system uses the Go-back-N ARQ Protocol with a window size of 7. If each packet carries 1000 bits of data, how long does it take to send 1 million bits of data if the distance between the sender and receiver is 5000 Klm and the propagation speed is  $2 \times 10^8$  m/s. Ignore transmission, waiting, and processing delays, and ignore the overhead due to the header and trailer. We assume no data or control frame is lost or damaged.

$$\begin{aligned}\text{No. of Packets} &= \frac{\text{Total No. of bits}}{\text{No of bits in one packet}} \\ &= \frac{1 \times 10^6}{1 \times 10^3} = 1000 \text{ packet}\end{aligned}$$

$$\begin{aligned}\text{Time to send 1 packet} &= \frac{\text{Distance between sender \& Receiver}}{\text{Propagation speed}} \\ &= \frac{5000 \times 10^3 \text{ m}}{2 \times 10^8 \text{ m/s}} = 0.025 \text{ sec}\end{aligned}$$

$$\text{Time to send all packets} = 1000 \times 0.025 = 25 \text{ sec}$$

